



## **Sampling Analysis Plan Development for Industrial Landfills**

### **Technical Guidance Document SW 03-01**

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The owner or operator of an Industrial Landfill is required to develop and submit a Sampling and Analysis Plan (SAP) to the Kansas Department of Health and Environment (KDHE) which details groundwater sampling and analysis procedures to be used at the facility. Since this document will be used throughout the active and post-closure life of a facility, an adequate SAP is important to ensure that monitoring results will provide data representative of groundwater quality upgradient and downgradient of the facility. This guidance was written to assist in the development of the required SAP. Items included in this guidance are considered to address the minimum information required by KDHE. This guidance is based on the Kansas Solid Waste Regulations, the Resource Conservation and Recovery Act (RCRA) Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD), and standard practices developed in other states and industry.

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#### **GENERAL FACILITY INFORMATION**

An essential part of the SAP is a description of the groundwater monitoring system. The number of monitoring wells, when they were installed, and the spatial relationship between the monitoring well locations and the landfill cells must be noted. A discussion of the characteristics of the uppermost aquifer is necessary, including the aquifer rate of recharge and flow direction.

A table must be included summarizing information for all monitoring wells such as top of casing elevation relative to mean sea level (MSL), approximate depth to water, installed depth, position (upgradient/downgradient), casing diameter, screen interval, and geologic formations being monitored. Well logs for each monitoring well in the system must be included in the appendices.

The SAP must include a site location map and a facility map. The site location map must show the landfill location relative to the nearest city and main roads. The facility map must identify facility property lines, landfill cell boundaries, monitoring well locations, on-site buildings, and other pertinent facility features. The SAP must also identify the months in which sampling will take place, as well as specify the parameters to be

sampled during each event. An industry-specific and site-specific parameter list must be developed based on current and past processes and all applicable waste streams. Initial waste analyses are required for each waste stream and after a process or source material change.

#### **DOCUMENTATION**

Proper field documentation of each sampling event is vital to the success of the groundwater monitoring program. The SAP must include provisions to properly record all applicable information while performing the field activities. Information can be recorded in a field logbook or on data sheets prepared prior to the sampling event. If data sheets are to be used, the SAP should include an example.

General site information such as weather conditions (air temperature, wind direction, precipitation), date of activity, and a list of the field team members should be recorded in the field notes. For each monitoring well sampled, the total depth, static water level, and thickness of immiscible layers (if present) must be recorded. Time of well purging, method of evacuation, purge rate, purge volume, and screening results of the purge parameters should also be recorded in the field notes, as should the sample time, sample

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collector, order of sample collection, and sampling method. Any observations such as unusual monitoring well recharge rates, deficiencies found during the well inspection, equipment malfunction(s), and/or possible sample contamination sources need to be recorded if observed. The SAP needs to include procedures for the documentation of all of these field measurements and observations.

### **FIELD PROCEDURES**

The SAP must contain a list of all equipment, dedicated and non-dedicated, necessary to collect samples from the monitoring wells. If possible, name brands and model numbers need to be provided. For example, "A Solinst Model PR-760A Water Level Indicator," is preferred over "a static water level indicator." The owner's manual for any equipment, which must be calibrated in the field, should be included as an appendix to the SAP. The sampling team must inspect the well and note the condition of the well pad, casing, protective casing, elevation reference mark, and security locks. Any deficiencies should be recorded in the field logbook. The SAP must include provisions for calibrating any equipment that needs calibration. Calibration procedures must be performed according to manufacturer's specifications for all mechanical equipment and measuring devices. Static water level and total depth of the monitoring well must be measured to a permanent reference point at the top of the well casing to the nearest .01 foot. If any immiscible layer is present, its thickness should also be measured to the nearest .01 foot. Static water level measurements must be completed at all wells prior to the purging of any monitoring well.

#### Purging Procedure

Stagnant water must be evacuated from a monitoring well prior to sample collection so that a representative sample may be obtained from the aquifer. An adequate SAP includes the equipment and procedures used to purge each monitoring well. Wells need to be purged in sequential order from least contaminated to most contaminated,

based on previous laboratory analyses, to minimize the risk of cross-contamination of equipment. To decrease agitation and obtain representative samples, water should be purged from a monitoring well at a rate slower than the well recharges. The minimum amount of water to be purged is three borehole volumes. A borehole volume is the water present in the well casing plus the water present in the pore space of the gravel pack surrounding the well casing. The SAP must contain the formula used for calculating borehole volume. It is also necessary to note how the evacuated water will be disposed. In addition to the minimum three borehole volumes, water must be purged until the temperature, pH, and conductivity of the purge water have stabilized within 10% between borehole volumes. These three purge parameters should be analyzed at a frequency no greater than once per borehole volume. Circumstances may exist where evacuating a minimum of three borehole volumes from a monitoring well is not practical. Examples are: an aquifer with an extremely slow recharge rate, or a monitoring system utilizing a low-flow purging method. The SAP should note these special conditions.

#### Sampling Procedures

Samples must be collected from a monitoring well within 24 hours of measuring the static water level and within 2 hours of purging the well. As with the measurement recording and the purge procedures, samples should be collected in the order from the least contaminated monitoring well to the most contaminated, based on prior analyses. The SAP needs to identify the equipment and procedures used at each well to obtain a representative groundwater sample. If water is collected from the discharge line of a pump, the maximum flow rate should be sufficiently slow to avoid agitation and loss of volatile organic compounds. Samples for different analytes must be collected in the proper order as specified in the TEGD. Non-filtered metal samples are preferred; however, field filtered samples will be allowed on a site specific basis. A table should be included in

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the SAP that lists the containers used for sample collection, preservation procedures (e.g. ice, hydrochloric acid), maximum allowable holding times, the analytical parameters and the analytical method to be used.

#### Field Quality Control Samples

Collection and preparation of several types of quality control samples are necessary. The SAP must describe the protocol and frequency for preparing blind field duplicates, trip blanks, and/or decontamination rinsate blanks.

#### Equipment Decontamination Procedures

Some field equipment may be dedicated to an individual monitoring well. For non-dedicated equipment used at multiple wells, decontamination of the equipment is necessary between use at each monitoring well. The SAP needs to describe the materials and procedures used for decontamination of equipment. All equipment must be decontaminated by washing with a non-phosphate detergent, followed by a thorough rinse with de-ionized water. After cleaning, the equipment should be wrapped or bagged to prevent contamination while not in use. The SAP needs to contain detailed decontamination procedures for all field equipment. Provisions for the containment and disposal of equipment decontamination rinsate must also be included in the SAP.

#### Sample Labels and Chain of Custody Procedures

Proper sample labeling and chain of custody are necessary for the tracking of each sample from the time of sample collection to laboratory analysis. A description of all procedures necessary to label a sample and ship it to the laboratory is required in the SAP. Every sample container needs a label which notes the facility name, sample identification (monitoring well) number, date and time of sample collection, analysis required, and any other data required by the laboratory. Once labeled, a sample must be

transported to the laboratory for analyses. Proper chain of custody procedures are to be followed and documented. The SAP must include the method of sample transport and an example of the chain of custody form to be used. Chain of custody forms must include the sample identification, date and time of sample collection, sample collector, any preservative used, analyses requested, and provisions for the transfer of sample custody.

### **LABORATORY ANALYSES**

The SAP needs to summarize the laboratory quality assurance/quality control (QA/QC) program. The analytical methods must be noted, as well as the appropriate holding times. The practical quantitation limits (PQLs) must be proposed for the constituents of concern and must be at or below the maximum contaminant level (MCL) or Risk-based Standards for Kansas (RSK). All analyses must be performed by a laboratory certified by KDHE for the analytical methods used. Owners and operators of landfill facilities are responsible for the validation of analytical results from laboratories. Upon receipt of laboratory data, the owner/operator needs to review the laboratory's QA/QC information and determine if the analytical results are valid. The SAP must include provisions for this review.

#### Reporting Analytical Results

The analytical results for each sampling event must be submitted to KDHE as part of a comprehensive report covering the entire sampling event. The SAP should explain what information will be presented in these reports. Sampling event reports must be submitted within 90 days of the sampling event and must include the following:

- purpose of sampling (i.e. detection or assessment monitoring);
- a copy of field notes and/or field data sheets;
- a copy of the laboratory analytical report;
- compilation of the analytical results (text summary, graph, and table);
- a laboratory data validation summary;

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- an evaluation of the laboratory data, chain of custody, and field data to determine if the analytical and field results are valid;
- direction of groundwater flow, including a potentiometric surface map;

- any deviations from the SAP during the sampling event and reasons for the change; and
- certification from a qualified groundwater scientist  
(a licensed geologist or professional engineer who has sufficient training and experience in groundwater hydrology and related fields).

### **Additional Information**

These are general guidelines only. For information regarding any specific or different management options, you may contact the Bureau of Waste Management at (785)296-1600 or at the address at the top of this document. This document and additional information are also available on BWM's website: [www.kdhe.state.ks.us/waste](http://www.kdhe.state.ks.us/waste).